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1998 ASHG AWARD FOR EXCELLENCE IN EDUCATION
Remarks on Receiving the ASHG Award: Science and Science Education

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Friends, old and new:

Needless to say, I am flattered and honored to be the recipient of this award. Further, I appreciate the opportunity to say a few words, in a personal way, at the end of this troublesome 20th century as well as at the end of my professional career.

The science of genetics is just about 100 years old, if we take 1900 as the starting point. When our Society was established in 1948, nearly all of the essential facts and mechanisms for heredity (chromosomes and genes) became known. A few years later, in the early 1950s, the molecular mechanisms of heredity began to emerge and then exploded into our present molecular age. No doubt, we have every right to congratulate ourselves for having accomplished so much in so short a time.

And yet, that is not quite a true summary of the history of genetics. In fact, I estimate that for about one-third of its history (1929–64, with a peak at 1948), genetics was under official attack and was being persecuted in some parts of the world. This is why I chose "Science and Science Education" as the theme of my comments for you today. I shall divide the general theme into two parts—the first part dealing with the natural enemies of natural science and the second part dealing with the defense of natural science against its enemies.

Natural science has always had natural enemies. I call them "natural enemies" because they arise naturally. Natural science frequently, if not always, steps on the toes of other people. It may interfere with the authorities in other fields. Even a homemade telescope was once considered by the Christian church as a threat to the authority of the priest, because the telescope enabled the astronomer to see things that the priests may not believe. The troubles between natural science and religion were, to a large extent, solved by separation of the two fields. As Robert Frost wrote, "Good fences make good neighbors."

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But it was not so easy with other natural enemies of natural science. Ideology—particularly political ideology—is another natural enemy of science. For instance, take the political philosophy known as "dialectical materialism." For its believers, this "ism" is more a Bible than is the holy book of any religion. It was regarded as the absolute truth for all things at all times in all history. The knowledge gained by natural science may or may not be consistent with what dialectical materialism predicts. Thus, I should have said, perhaps, that natural science is the natural enemy of ideology rather than the other way around.

Dialectical materialism is a powerful political philosophy. If actual facts do not coincide with the theory, its proponents modify the facts to fit the theory, not the theory to fit the facts. "Facts" simply are made to order. Strange as it may seem to some of you, this twist was what actually happened to the science of genetics in the first half and middle of the 20th century. Mendelian genetics was denounced as bourgeois and reactionary, whereas Lysenko genetics was praised as proletarian and progressive. Mendelian genetics obeys certain laws of nature; Lysenko genetics permits the change of one species into another (with different chromosomes) by environmental conditions. Further, supporters of Lysenko genetics were called "patriots," whereas Mendelian geneticists are regarded as foreign spies, subject to the death penalty. Let us hear the cry of one such persecuted geneticist (as quoted by Medvedev [1969, p. 58]):

> We shall go to the pyre;
> we shall burn;
> but we shall not retreat
> from our conviction.
> (N. I. Vavilov)

N. I. Vavilov (1887–1943), member of the U.S.S.R. Academy of Sciences and director of its Genetics Institute, was the president of the Lenin All-Union Academy of Agricultural Sciences. He studied genetics with William Bateson at Cambridge University before World War I. A world traveler, he was the supreme authority on the origins of our cultivated plants. He had several hundred publications, a few of which had been translated into

English by the U.S. Department of Agriculture. He attended the VI Congress of Genetics in Ithaca, New York, in 1932 and was elected president of the VII Congress of Genetics, scheduled for 1937 in Moscow. The congress was subsequently postponed and was held in Edinburgh in 1939, still with Vavilov as its president; but he was unable to attend. He died in prison in 1943 at age 55 years. His grave was never found.

Two more familiar properties of ideology may be noted. One is its similarity to superstition, albeit cloaked in high-tech and ultramodern language. Another property is that ideology breeds corruption. Well-accepted ideology breeds well-accepted corruption. Both properties are readily observable in areas where ideology, not law, still rules.

Now we come to the second part of my remarks—namely, comments on the role of science education in a world of foes of science. We know from common experience that it is comparatively easier to explain a scientific fact to a layman than to explain the methods, the procedures, and the principles of science. If one insists that science itself also has its own ideology, then, I will say, let that ideology be the autonomy of science, although I personally feel that autonomy is an essential property of science, not its guiding ideology. If there were no autonomy, there would be no science to speak of.

Modern historians seem to emphasize the interpretation of history more than the detailed recording of past events. Thus, some scholars of the Lysenko corruption of genetics offer the following interpretation. At the beginning of this century, Russia was poor and backward. The government was impatient with the slow progress, particularly in agriculture. Hence, Lysenkoism emerged and promised almost instant improvement of agriculture. Not being a historian by training, I couldn't help but wonder why it happened in Russia, while many other countries were even poorer and more backward than Russia during that same period and yet did not produce anything like Lysenkoism. Apparently, poverty and backwardness are not sufficient factors for Lysenkoism. As a suggestion, I think the 1917 revolution and its quick-fix and quick-result policies were responsible for the emergence of the "new and progressive" genetics. The inheritance of acquired characteristics, a false medieval belief adopted by Lysenko, supposedly would guarantee a fast result in breeding new varieties of wheat and other crops. It did not happen.

To conclude about our new science education, I think the first requirement is the depoliticization of the classroom. We shall teach science. Creation "science" is not science. Neither is dialectical materialism. We strive to be scientifically correct, not politically correct. The autonomy of science permits little, if any, cultural effects on science. Natural science deals with laws of nature, not habits of man.

Science education does not work like a spray; you don't get instant relief with one squeeze. Nor does science education work as a vaccine. Vaccination is usually a one-shot affair, and you get its protection. Science education, rather, acts like a health food, which you take regularly for a number of years. Then you get the benefit of good health and longevity.

Now, you are ready to face the antiscience forces. You should feel equally comfortable whether you are with a friend or encounter a foe, because you know that no one can make you retreat from your conviction.

In conclusion, I hope that, in the new century, there will be less lazy and sterile ideology and more diligent and productive science. I wish you good luck, good science, and good news tomorrow. Thank you.

Reference

Medvedev ZA (1969) The rise and fall of T. D. Lysenko. Columbia University Press, New York